2.6.4 Fuel Building Ventilation System

1.0 Description

The fuel building ventilation system (FBVS) receives the conditioned air supply from the nuclear auxiliary building ventilation system (NABVS). The exhaust from the FBVS is processed by the NABVS through a filtration train, and the exhaust air is directed to the plant stack.

The FBVS controls the Fuel Building temperature, humidity and air change rate for personnel comfort, personnel safety, and equipment protection during normal plant operation. The FBVS provides cooling, heating, and ventilation for the Fuel Building (FB) to remove equipment heat and heat generated from other sources. The FBVS also provides heat to maintain a minimum temperature in the building. The FBVS provides a minimal air change rate for the building and controls the building pressurization to reduce spreading of contamination.

The FBVS provides the following safety-related functions:

- Isolation of the supply and exhaust airflow of the fuel handling hall.
- Isolation of the supply and exhaust airflow of the hall in front of equipment hatch.
- Isolation of the supply and exhaust airflow to the room in front of the emergency air lock.
- Isolation of the FB from NABVS supply and exhaust on receipt of containment isolation signal or high radiation signal in the Reactor Building. The FB atmosphere is then processed through iodine filtration trains of the safeguard building controlled-area ventilation system (SBVS).
- Heating of the rooms which have safety-related systems, structures, or components containing borated fluid and the rooms surrounding the extra borating system tanks to maintain minimum ambient room temperatures.
- Cooling of rooms which have the extra borating system pumps and the fuel pool cooling system pumps to maintain ambient conditions.

The FBVS provides the following non-safety related functions:

- Maintains the room ambient conditions for operation of equipment and to allow personnel access during normal operation.
- Reduces spread of contamination from the contaminated rooms to less contaminated rooms during normal operation.
- Reduces concentration of aerosols and radioactive gases from the room air.
- Maintains a negative pressure within the Fuel Building with respect to outside atmosphere.

2.0 Arrangement

2.1 The functional arrangement of the FBVS is as shown in Figure 2.6.4-1—Fuel Building Ventilation System Functional Arrangement.

2.2 The location of the FBVS equipment is as listed in Table 2.6.4-1—Fuel Building Ventilation System Equipment Mechanical Design.

2.3 Separation exists between the FBVS ventilation trains in the Fuel Building. The FBVS is divided into two subsystems referred to as cells. The cells separate the ventilation system serving the systems in the Fuel Building. Each cell serves approximately half of the building.

3.0 Mechanical Design Features

3.1 Equipment listed in Table 2.6.4-1 as ASME AG-1 is designed, inspected and tested per ASME AG-1.

3.2 Equipment listed in Table 2.6.4-1 performs the function listed in Table 2.6.4-1.

3.3 Equipment identified as Seismic Category I in Table 2.6.4-1 can withstand a design basis seismic load without loss of safety function as listed in Table 2.6.4-1.

4.0 Displays and Controls

4.1 Displays listed in Table 2.6.4-2—Fuel Building Ventilation System Equipment I&C and Electrical Design, are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed.

4.2 The FBVS equipment controls are provided in the MCR and RSS as listed in Table 2.6.4-2.

4.3 Actuators listed as being controlled by a priority actuator control system (PACS) module in Table 2.6.4-2 are controlled by a PACS module.

5.0 Electrical Power Design Features

5.1 The equipment designated as Class 1E in Table 2.6.4-2 are powered from the Class 1E division as listed in Table 2.6.4-2 in a normal or alternate feed condition.

5.2 Motor operated dampers listed in Table 2.6.4-2 fail to the position as shown in Table 2.6.4-2 on loss of power.

6.0 Environmental Qualifications

6.1 Electrical drivers for the equipment listed in Table 2.6.4-2 for harsh environment can perform the safety function in Table 2.6.4-1 following exposure to the design basis environments for the time required.

7.0 Equipment and System Performance

7.1 The FBVS maintains a negative pressure in the Fuel Building relative to the environment.

7.2 Upon receipt of containment isolation signal or high radiation alarm signal in the Reactor Building, the FB is isolated from the NABVS by automatically closing the air supply and exhaust isolation dampers.

8.0 Inspections, Tests, Analyses and Acceptance Criteria

The inspection, tests, analyses, and acceptance criteria (ITAAC) for the FBVS are specified in Table 2.6.4-3—Fuel Building Ventilation System ITAAC.

Table 2.6.4-1—Fuel Building Ventilation System Equipment Mechanical Design (3 Sheets)

Equipment Description	Equipment Tag Number [1]	Equipment Location	ASME AG-1 Code	Function	Seismic Category
Supply and Exhaust of Fuel Handling Hall					
Motor Operated Supply Damper	30KLL11AA002	Fuel Building	Yes	Close	I
Motor Operated Supply Damper	30KLL14AA002	Fuel Building	Yes	Close	I
Motor Operated Exhaust Damper	30KLL21AA002	Fuel Building	Yes	Open	I
Motor Operated Exhaust Damper	30KLL24AA002	Fuel Building	Yes	Open	I
Supply and Exhaust in front of Equipment Hatch					
Motor Operated Supply Damper	30KLL11AA001	Fuel Building	Yes	Close	I
Motor Operated Supply Damper	30KLL14AA001	Fuel Building	Yes	Close	I
Motor Operated Exhaust Damper	30KLL21AA001	Fuel Building	Yes	Close	I
Motor Operated Exhaust Damper	30KLL24AA001	Fuel Building	Yes	Close	I
Supply and Exhaust in front of Emergency Airlock					
Motor Operated Supply Damper	30KLL11AA003	Fuel Building	Yes	Close	I
Motor Operated Supply Damper	30KLL14AA003	Fuel Building	Yes	Close	I
Motor Operated Exhaust	30KLL21AA003	Fuel Building	Yes	Close	I

Table 2.6.4-1—Fuel Building Ventilation System Equipment Mechanical Design (3 Sheets)

Equipment Description	Equipment Tag Number [1]	Equipment Location	ASME AG-1 Code	Function	Seismic Category
Damper					
Motor Operated Exhaust Damper	30KLL24AA003	Fuel Building	Yes	Close	I
Fuel Building Isolation					
Motor Operated Supply Damper (Cell 5)	30KLL34AA090	Fuel Building	Yes	Close	I
Motor Operated Supply Damper (Cell 5)	30KLL31AA049	Fuel Building	Yes	Close	I
Motor Operated Exhaust Damper (Cell 5)	30KLL41AA101	Fuel Building	Yes	Close	I
Motor Operated Exhaust Damper (Cell 5)	30KLL44AA101	Fuel Building	Yes	Close	I
Motor Operated Supply Damper (Cell 4)	30KLL34AA065	Fuel Building	Yes	Close	I
Motor Operated Supply Damper (Cell 4)	30KLL31AA090	Fuel Building	Yes	Close	I
Motor Operated Exhaust Damper (Cell 4)	30KLL41AA100	Fuel Building	Yes	Close	I
Motor Operated Exhaust Damper (Cell 4)	30KLL44AA100	Fuel Building	Yes	Close	I
Motor Operated Damper	30KLL21AA004	Fuel Building	Yes	Open	I
Motor Operated Damper	30KLL24AA004	Fuel Building	Yes	Open	I
Recirculation Cooling Units for the Extra Borating System					

Table 2.6.4-1—Fuel Building Ventilation System Equipment Mechanical Design (3 Sheets)

Equipment Description	Equipment Tag Number [1]	Equipment Location	ASME AG-1 Code	Function	Seismic Category
Pump Rooms					
Air Cooling Coil	30KLL61AC001	Fuel Building	Yes	N/A	I
Moisture Separator	30KLL61AT001	Fuel Building	Yes	N/A	I
Recirculation Fan	30KLL61AN001	Fuel Building	Yes	Run	I
Air Cooling Coil	30KLL64AC001	Fuel Building	Yes	N/A	I
Moisture Separator	30KLL64AT001	Fuel Building	Yes	N/A	I
Recirculation Fan	30KLL64AN001	Fuel Building	Yes	Run	I
Recirculation Cooling Units for the Fuel Pool Cooling System Pump Rooms					
Air Cooling Coil	30KLL61AC002	Fuel Building	Yes	N/A	I
Recirculation Fan	30KLL61AN002	Fuel Building	Yes	Run	I
Air Cooling Coil	30KLL61AC003	Fuel Building	Yes	N/A	I
Recirculation Fan	30KLL61AN003	Fuel Building	Yes	Run	I
Air Cooling Coil	30KLL64AC002	Fuel Building	Yes	N/A	I
Recirculation Fan	30KLL64AN002	Fuel Building	Yes	Run	I
Air Cooling Coil	30KLL64AC003	Fuel Building	Yes	N/A	I
Recirculation Fan	30KLL64AN003	Fuel Building	Yes	Run	I

1) Equipment tag numbers are provided for information only and are not part of the certified design.

Table 2.6.4-2—Fuel Building Ventilation System Equipment I&C and Electrical Design (4 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E Source(2)	Failure Position	EQ – Harsh Env.	PACS	MCR/ RSS Displays	MCR/RSS Controls
Supply and Exhaust of Fuel Handling Hall								
Motor Operated Supply Damper	30KLL11AA002	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Damper	30KLL14AA002	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper	30KLL21AA002	Fuel Building	Division 1 N Division 2 A	Open	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper	30KLL24AA002	Fuel Building	Division 4 N Division 3 A	Open	Yes	Yes	Position / Position	Open-Close / Open-Close
Supply and Exhaust in front of Equipment Hatch								
Motor Operated Supply Damper	30KLL11AA001	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Damper	30KLL14AA001	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper	30KLL21AA001	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper	30KLL24AA001	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Supply and Exhaust in front of Emergency Airlock								

Table 2.6.4-2—Fuel Building Ventilation System Equipment I&C and Electrical Design (4 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E Source(2)	Failure Position	EQ – Harsh Env.	PACS	MCR/ RSS Displays	MCR/RSS Controls
Motor Operated Supply Damper	30KLL11AA003	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Damper	30KLL14AA003	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper	30KLL21AA003	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper	30KLL24AA003	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Fuel Building Isolation								
Motor Operated Supply Damper (Cell 5)	30KLL34AA090	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Damper (Cell 5)	30KLL31AA049	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper (Cell 5)	30KLL41AA101	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Damper (Cell 5)	30KLL44AA101	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Damper (Cell 4)	30KLL34AA065	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Damper (Cell 4)	30KLL31AA090	Fuel Building	Division 1 N Division 2 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust	30KLL41AA100	Fuel Building	Division 1 N	Close	Yes	Yes	Position /	Open-Close /

Table 2.6.4-2—Fuel Building Ventilation System Equipment I&C and Electrical Design (4 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E Source(2)	Failure Position	EQ – Harsh Env.	PACS	MCR/ RSS Displays	MCR/RSS Controls
Damper (Cell 4)			Division 2 A				Position	Open-Close
Motor Operated Exhaust Damper (Cell 4)	30KLL44AA100	Fuel Building	Division 4 N Division 3 A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Damper	30KLL21AA004	Fuel Building	Division 1 N Division 2 A	Open	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Damper	30KLL24AA004	Fuel Building	Division 4 N Division 3 A	Open	Yes	Yes	Position / Position	Open-Close / Open-Close
Recirculation Cooling Units for the Extra Borating System Pump Rooms								
Recirculation Fan	30KLL61AN001	Fuel Building	Division 1 N Division 2 A	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Fan	30KLL64AN001	Fuel Building	Division 4 N Division 3 A	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Cooling Units for the Fuel Pool Cooling System Pump Rooms								
Recirculation Fan	30KLL61AN002	Fuel Building	Division 1 N Division 2 A	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Fan	30KLL61AN003	Fuel Building	Division 1 N Division 2 A	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Fan	30KLL64AN002	Fuel Building	Division 4 N Division 3 A	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop

Table 2.6.4-2—Fuel Building Ventilation System Equipment I&C and Electrical Design (4 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E Source(2)	Failure Position	EQ – Harsh Env.	PACS	MCR/ RSS Displays	MCR/RSS Controls
Recirculation Fan	30KLL64AN003	Fuel Building	Division 4 [N] Division 3 [A]	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) [N] denotes division the component is normally powered from, while [A] denotes division the component is powered from when alternate feed is implemented.

Table 2.6.4-3—Fuel Building Ventilation System ITAAC
(4 Sheets)

Reference Section Number	Commitment Wording	Inspection, Analysis or Test	Acceptance Criteria
2.1	The functional arrangement of the FBVS is as shown on Figure 2.6.4-1.	Inspections of the as-built system will be conducted.	The as-built FBVS conforms to the functional arrangement as shown in Figure 2.6.4-1.
2.2	Equipment shown on Figure 2.6.4-1 is located as listed in Table 2.6.4-1.	An inspection will be performed of the location of the equipment listed in Table 2.6.4-1.	The equipment listed in Table 2.6.4-1 is located as listed in Table 2.6.4-1.
2.3	The FBVS is divided into two subsystems referred as cells. The cells separate the ventilation system serving the systems in the Fuel Building. Each cell serves approximately half of the building.	Inspection will be performed of the FBVS.	Two subsystems of the FBVS are located in separate areas of the Fuel Building.
3.1	The FBVS equipment listed as being ASME AG-1 Code in Table 2.6.4-1 is designed, inspected and tested in accordance with ASME AG-1 Code.	Analyses will be performed and inspections will be conducted of the as-built components listed in Table 2.6.4-1.	The FBVS equipment listed in Table 2.6.4-1 is designed, inspected, and tested in accordance with ASME AG-1 Code.
3.2	Equipment listed in Table 2.6.4-1 can perform the function listed in Table 2.6.4-1 under system design basis conditions.	Tests and analyses or a combination of tests and analyses will be performed.	The as-installed equipment changes position as listed Table 2.6.4-1 under system design basis conditions.
3.3	Equipment identified as Seismic Category I in Table 2.6.4-1 can withstand a design basis seismic load without loss of safety function as listed in Table 2.6.4-1.	a) Inspections will be performed of the equipment identified as Seismic Category I in Table 2.6.4-1. b) Type tests, tests, analyses or a combination of tests and analyses will	a) The equipment designated as Seismic Category I in Table 2.6.4-1 is installed as designed. b) The equipment designated as Seismic Category I in Table 2.6.4-1 can withstand a design

Table 2.6.4-3—Fuel Building Ventilation System ITAAC
(4 Sheets)

Reference Section Number	Commitment Wording	Inspection, Analysis or Test	Acceptance Criteria
		be performed on the equipment designated as Seismic Category I in Table 2.6.4-1.	basis seismic load without loss of safety function.
4.1	Displays listed in Table 2.6.4-2 are retrievable in the MCR and the remote shutdown station (RSS) as listed.	Inspections will be performed for the existence or retrieve-ability of the displays in the MCR and the RSS as listed in Table 2.6.4-2.	a) The displays listed in Table 2.6.4-2 as being retrieved in the MCR can be retrieved in the MCR. b) The displays listed in Table 2.6.4-2 as being retrieved in the RSS can be retrieved in the RSS.
4.2	Controls exist in the MCR and the RSS as listed in Table 2.6.4-2.	Test will be performed for the existence of control signals from the MCR and the RSS to the equipment listed in Table 2.6.4-2.	a) The controls listed in Table 2.6.4-2 as being in the MCR exist in the MCR. b) The controls listed in Table 2.6.4-2 as being in the RSS exist in the RSS.
4.3	Actuators listed as being controlled by a Priority Actuator Control System (PACS) module in Table 2.6.4-2 are controlled by a PACS module.	An operational test will be performed using test signals. An inspection will be performed on the actuation of the actuator.	The actuators listed as being controlled by a PACS module in Table 2.6.4-2 actuate to the state requested by the test signal.
5.1	The components designated as Class 1E in Table 2.6.4-2 are powered from the Class 1E division as listed in Table 2.6.4-2 in a normal or alternate feed condition.	a) Testing will be performed for the components designated as Class 1E in Table 2.6.4-2 by providing a test signal in each normally aligned division. b) Testing will be performed for the components designated as Class 1E in Table 2.6.4-2 by providing a test signal in each division with the alternate feed aligned to the divisional pair.	a) The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.6.4-2. b) The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E component identified in Table 2.6.4-2.
5.2	Motor operated dampers listed in Table 2.6.4-2 fail	Testing will be performed for the motor operated	Following loss of power, the motor operated

Table 2.6.4-3—Fuel Building Ventilation System ITAAC
(4 Sheets)

Reference Section Number	Commitment Wording	Inspection, Analysis or Test	Acceptance Criteria
	to the position as shown in Table 2.6.4-2 on loss of power.	dampers listed in Table 2.6.4-2 to verify the position of dampers on loss of power.	dampers listed in Table 2.6.4-2 fail to the position as shown in Table 2.6.4-2.
6.1	Electrical drivers for equipment listed in Table 2.6.4-2 for harsh environment can perform the safety function in Table 2.6.4-1 following exposure to the design basis environments for the time required.	a) Type tests, tests, analyses or a combination of tests and analyses will be performed to demonstrate the ability of the equipment listed for harsh environment in Table 2.6.4-2 to perform the function listed in Table 2.6.4-1 for the environmental conditions that could occur before and during a design basis accident. b) For equipment listed for harsh environment in Table 2.6.4-2 an inspection will be performed of the as-installed Class 1E equipment and the associated wiring, cables and terminations.	a) The Class 1E equipment listed for harsh environment in Table 2.6.4-2 can perform the function listed in Tables 2.6.4-1 before and during design basis accidents for the time required to perform the listed function. b) Inspection concludes that the as-installed Class 1E equipment and associated wiring, cables, and termination as listed in Table 2.6.4-2 for harsh environment conform with the design.
7.1	The FBVS maintains a negative pressure in the Fuel Building relative to the environment.	Tests will be performed on the capability of the system to maintain a negative pressure in the Fuel Building relative to the environment.	The FBVS maintains a negative pressure in the Fuel Building relative to the environment.
7.2	Upon receipt of containment isolation signal or high radiation alarm signal in the Reactor Building, the FB is isolated from the NABVS by automatically closing the air supply and exhaust	A test will be performed to verify that upon receipt of containment isolation signal or high radiation alarm signal in the Reactor Building, the FB is automatically isolated from the NABVS air supply and exhaust isolation dampers.	A test conforms that upon receipt of containment isolation signal or high radiation alarm signal in the Reactor Building, the FB is isolated from the NABVS by automatically closing the air supply and exhaust isolation dampers.

Table 2.6.4-3—Fuel Building Ventilation System ITAAC
(4 Sheets)

Reference Section Number	Commitment Wording	Inspection, Analysis or Test	Acceptance Criteria
	isolation dampers.		